

ISED CABid: ES1909

Test report No:
NIE: 68042RRF.005

Partial Test report

USA FCC Part 15.31(h), 15.225, 15.247, 15.209

CANADA RSS-247, RSS-Gen

Radio Frequency Devices.

Operation within the band 13.110-14.010 MHz

Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz

Radiated emission limits; general requirements.

Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices.

General Requirements and Information for the Certification of Radio Apparatus.

(*) Identification of item tested	Battery control unit
(*) Trademark	Inuheat
(*) Model and /or type reference	PP3/3000
Other identification of the product	HW version: 3.1 SW version: 3.3 FCC ID: 2A2NC-1100047 IC ID: 27559-1100047
(*) Features	BLE, NFC
Applicant	Inuheat Group AB Hedtångsvägen 6 436 53 Hovås, Sweden
Test method requested, standard	USA FCC Part 15.31(h) (10-1-20 Edition): Measurement standards. USA FCC Part 15.225 (10-1-20) Edition: Operation within the bands 13.110 – 14.010 MHz USA FCC Part 15.247 (10-1-20) Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-20) Edition: Radiated emission limits; general requirements. CANADA RSS-210 Issue 10 (December 2019). CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 Amendment 1 (March 2019). -Transmitter out of band radiated emissions with simultaneous transmissions. Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid Systems Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.

Approved by (name / position & signature)	Jose Manuel Gómez Industrial & Automotive EMC Lab Manager
Date of issue	2021-08-25
Report template No	FDT08_23 (*) "Data provided by the client"

Index

Competences and guarantees4

General conditions4

Uncertainty4

Data provided by the client4

Usage of samples5

Test sample description6

Identification of the client7

Testing period and place7

Document history7

Environmental conditions8

Remarks and comments8

Testing verdicts9

Summary9

Appendix A: Test results. Bluetooth Low Energy + RFID 13.56 MHz10

Competences and guarantees

DEKRA Testing and Certification S.A.U. is a testing laboratory competent to carry out the tests described in this report.

DEKRA Testing and Certification S.A.U. is an FCC-recognized accredited testing laboratory with the appropriate scope of accreditation that covers the performed tests in this report.

DEKRA Testing and Certification S.A.U. is an ISED-recognized accredited testing laboratory, CABid: ES1909, with the appropriate scope of accreditation that covers the performed tests in this report.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification at the time of performance of the test.

DEKRA Testing and Certification is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA Testing and Certification.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification and the Accreditation Bodies.

Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification internal document PODT000.

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample of the model PP3/3000 is a unit for supplying energy to heated garments as well as communication with an App in phones.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of result.

Usage of samples

Samples undergoing test have been selected by: The client.

- Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
68042B/108	Battery control unit	PP3/3000	40229	2021/06/11

Sample S/01 has undergone the test(s): All Radiated tests indicated in Appendix A.

Test sample description

Ports..... :	Port name and description		Cable				
			Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾	
	Terminal 1		NA	☐	☐	☐	
	Terminal 2		NA	☐	☐	☐	
--			☐	☐	☐		
Supplementary information to the ports..... :	Outputs alternating (plus/minus) square pulse power to garments when garment is recognized and a resistance is measured.						
Rated power supply	Voltage and Frequency			Reference poles			
				L1	L2	L3	N
	☒	AC: (-16Vac) - 16 Vac 1Hz (Output voltage to garment)					
	☒	DC: 4Vdc (Internal Battery)					
☒	DC: 5Vdc (Charging voltage)						
Rated Power	max 6.5W						
Clock frequencies..... :	1Hz square pulse						
Other parameters	--						
Software version	3.3						
Hardware version	3.1						
Dimensions in cm (W x H x D)	4.8 x 8.0 x 1.7						
Mounting position	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other: On garment					
Modules/parts..... :	Module/parts of test item			Type	Manufacturer		
	--						
Accessories (not part of the test item)	Description			Type	Manufacturer		
	--						
Documents as provided by the applicant	Description			File name	Issue date		
	--						

⁽³⁾ Only for Medical Equipment

Identification of the client

Inuheat Group AB
Hedtångsvägen 6
436 53 Hovås, Sweden

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-06-17
Date (finish)	2021-06-17

Document history

Report number	Date	Description
68042RRF.005	2021-08-25	First release

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

Remarks and comments

The tests have been performed by the technical personnel: José Manuel Jiménez and Miguel Manuel López.
Used instrumentation:

Radiated Measurements:

	Last Calibration	Due Calibration
1. Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N/A	N/A
2. Shielded Room ETS LINDGREN S101	N/A	N/A
3. Active Loop Antenna 9kHz-30MHz HEWLETT PACKARD 11966A	2020/07	2022/07
4. EMI Test Receiver 9kHz-7GHz ROHDE AND SCHWARZ ESR7	2019/10	2021/10
5. Biconical/Log Antenna 30MHz - 6GHz ETS LINDGREN 3142E	2020/10	2023/10
6. RF Pre-amplifier 40 dB, 10MHz - 6GHz BONN ELEKTRONIK BLNA 0160-01N	2021/03	2022/03
7. Horn antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2020/08	2023/08
8. Broadband Horn antenna 18 - 40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2020/05	2023/05
9. RF Pre-amplifier G>30dB, 1-18GHz BONN ELEKTRONIK BLMA 0118-3A	2020/10	2021/10
10. RF Pre-amplifier G>30dB, 18-40GHz BONN ELEKTRONIK BLMA 1840-3G	2019/11	2021/11
11. Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV40	2019/10	2021/10

Testing verdicts

Not applicable:	N/A
Pass:	P
Fail:	F
Not measured:	N/M

Summary

FCC PART 15 PARAGRAPH / RSS-247		
Requirement – Test case	Verdict	Remark
FCC 15.31 (h), FCC 15.209 (a), 15.247 (d) / RSS-Gen 8.9, RSS-247 5.5, FCC 15.249 (a)(B) / RSS -210 B.10(a)(b): - Emission limitations radiated (Transmitter)	P	(1)
<u>Supplementary information and remarks:</u> (1) Only co-location radiated spurious emission test was requested.		

Appendix A: Test results. Bluetooth Low Energy + RFID 13.56 MHz

INDEX

TEST CONDITIONS.....12

FCC 15.31 (h), 15.209 (a), 15.247 (d) / RSS-Gen 8.9, RSS-247 5.5, RSS -210 B.10(a)(b) Emission
limitations radiated (Transmitter).....14

TEST CONDITIONS

POWER SUPPLY (V):

Vnominal:	4Vdc
Type of Power Supply:	Battery

ANTENNA:

Type of Antenna:	Integral.
------------------	-----------

Antenna Gain:

- Bluetooth Low Energy: -5.6dBi
- RFID 13.56MHz: Not provided

RADIOS AND CHANNELS TESTED:

Bluetooth Low Energy (1M, 2M): Signaling Carriers

RFID: 13.56 MHz

The EUT was tested in the following operating mode:

- Continuous transmission with a modulated carrier at maximum power in all required channels selecting the supported data rates/modulations types.

During transmitter test the EUT was being controlled by the SW tool to operate in a continuous transmit mode on the test channel as required and in each of the different modulation modes.

Transmission modes selected with each Radio:

The following configurations were selected based on preliminary testing that identified those corresponding to the worst cases:

* Bluetooth Low Energy (1M, 2M): Transmitter radiated spurious emissions tests were performed with the EUT transmitting with signaling carriers.

* RFID 13.56 MHz: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in the single channel configuration supported by this radio.

Simultaneous transmission modes selected:

1. **Co-location Bluetooth Low Energy 1M and RFID 13.56 MHz** with the EUT configured to simultaneously transmit four signals at maximum output power.
2. **Co-location Bluetooth Low Energy 2M and RFID 13.56 MHz** with the EUT configured to simultaneously transmit four signals at maximum output power.

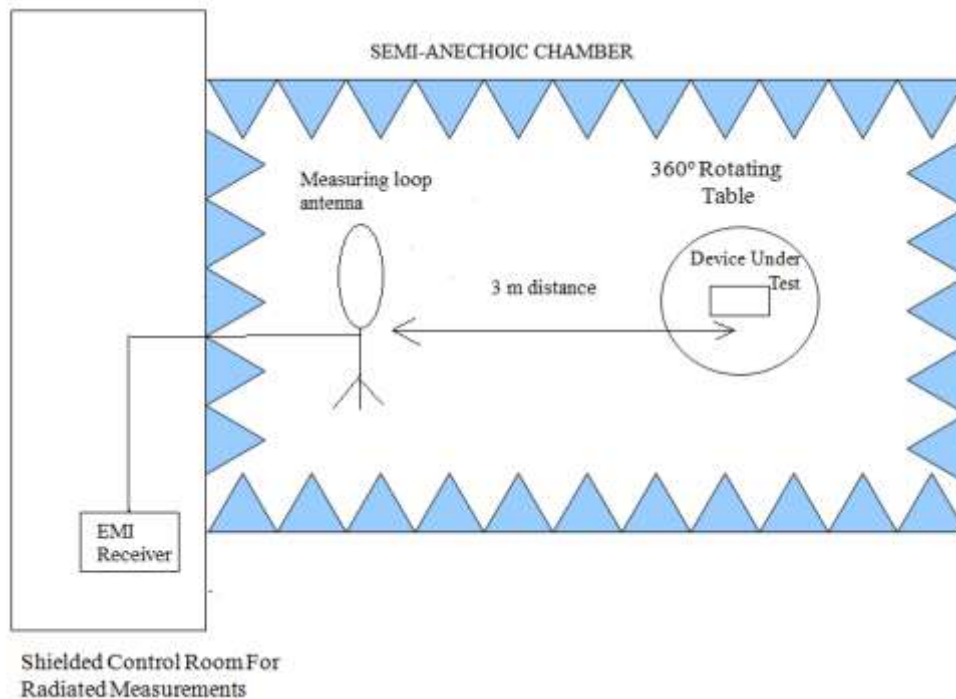
RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m (Loop antenna for the range between 9 kHz to 30 MHz and Bilog antenna for 30 MHz to 1000 MHz), at distance of 3 m for the frequency range 1 GHz-17 GHz (1 GHz-17 GHz Double ridge horn antenna) and at distance of 1 m for the frequency range 17 GHz-26 GHz (17 GHz-26 GHz horn antenna).

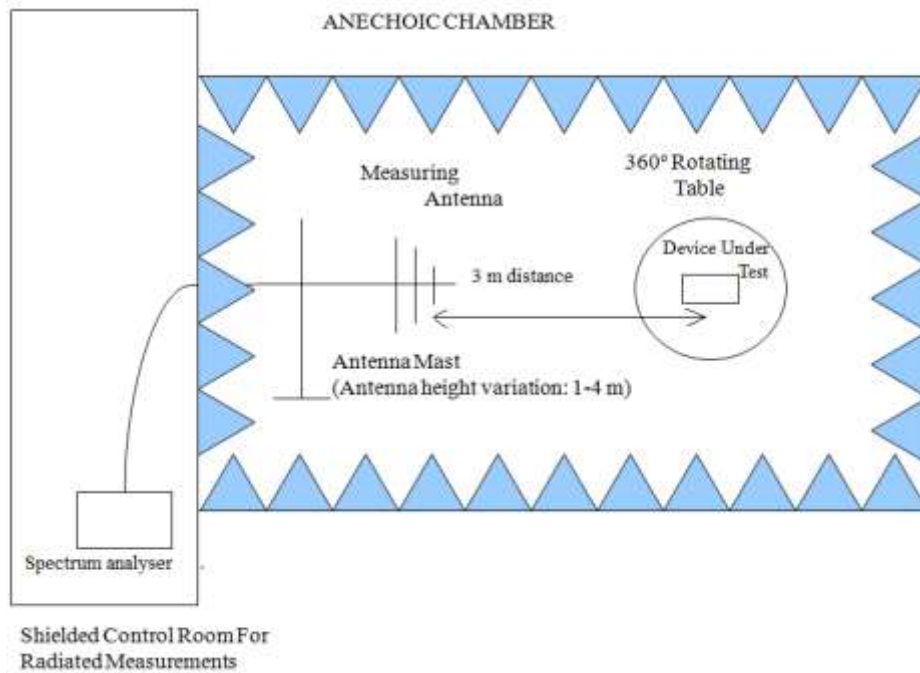
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

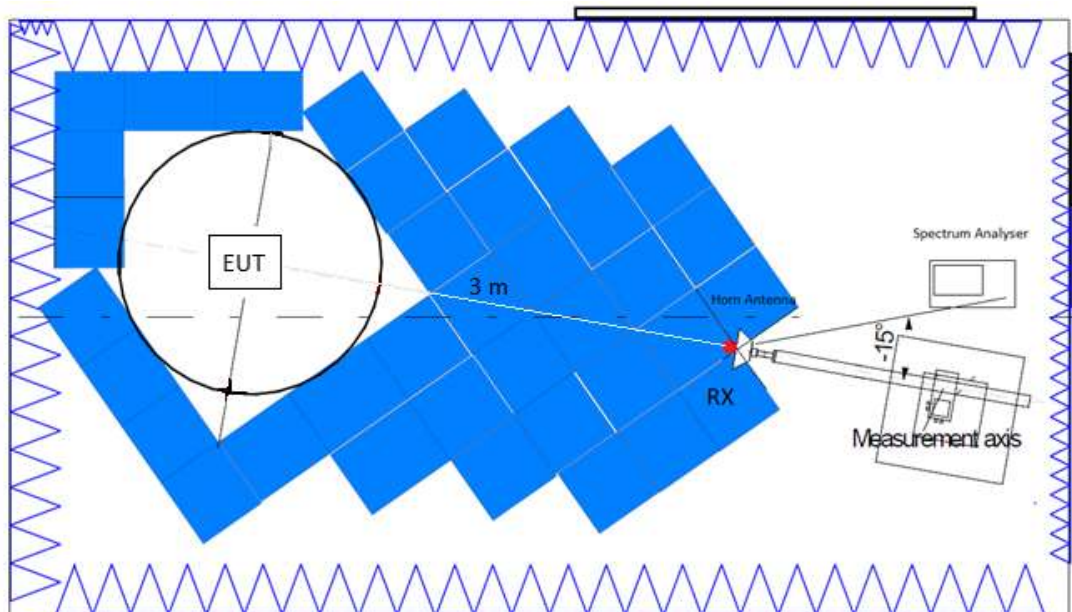
Radiated measurements setup 9 kHz to 30 MHz



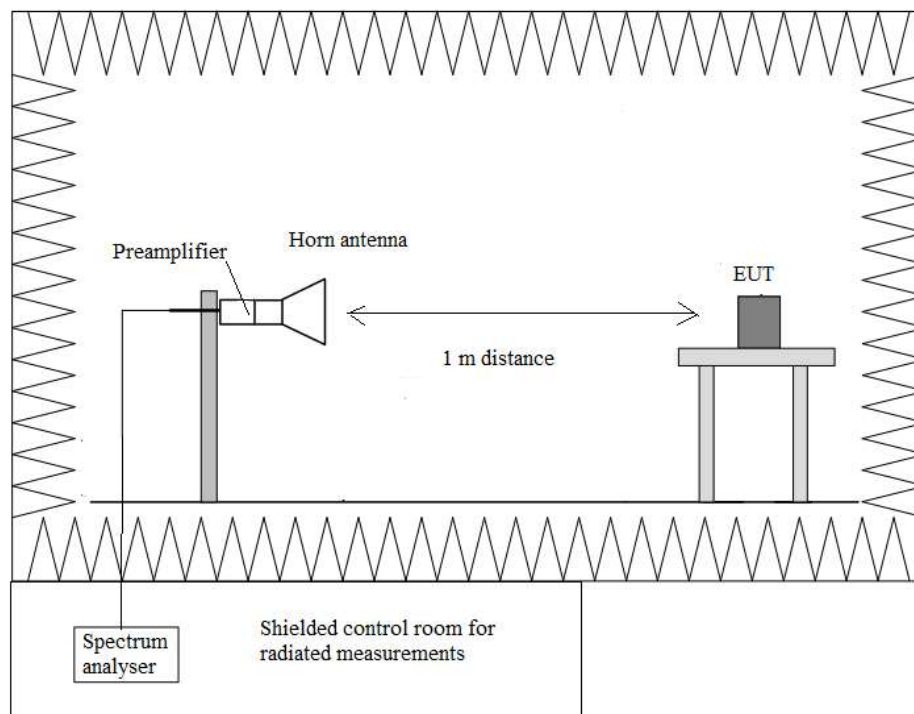
Radiated measurements setup $30 \text{ MHz} < f < 1 \text{ GHz}$:



Radiated measurements setup between 1 GHz to 17 GHz:



Radiated measurements above 17 GHz:



FCC 15.31 (h), 15.209 (a), 15.247 (d) / RSS-Gen 8.9, RSS-247 5.5, FCC 15.249 (a)(B) / RSS -210 B.10(a)(b) Emission limitations radiated (Transmitter)

SPECIFICATION:

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), appearing outside of the band 13.110 MHz - 14.010 MHz band must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c) / RSS-Gen):

Frequency Range (MHz)	Field strength ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	29.54	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 40000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RSS-247. Attenuation below the general field strength limits specified in RSS-Gen is not required.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-17 GHz and at distance of 1m for the frequency range 17 GHz-26 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

Test performed on the following worst cases in all relevant tests channels.

1. Co-location Bluetooth Low Energy 1M and RFID 13.56 MHz

Frequency range 9 kHz - 30 MHz

The spurious emissions do not depend on either the operating channel or the modulation mode.

No spurious frequencies detected at less than 20 dB below the limit.

Measurement uncertainty (dB): $< \pm 3.04$

Frequency range 30 MHz - 1 GHz

The spurious emissions below 1 GHz do not depend on either the operating channel or the modulation mode.

Spurious frequencies detected at less than 20 dB below the limit.

Spurious frequency (MHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
474.600	24.8	V	Quasi-Peak	$< \pm 5.17$
488.115	28.5	V	Quasi-Peak	$< \pm 5.17$
501.695	28.4	V	Quasi-Peak	$< \pm 5.17$
515.243	28.4	V	Quasi-Peak	$< \pm 5.17$
705.072	26.5	H	Quasi-Peak	$< \pm 5.17$
732.199	28.4	H	Quasi-Peak	$< \pm 5.17$
759.327	28.2	H	Quasi-Peak	$< \pm 5.17$
786.455	26.3	H	Quasi-Peak	$< \pm 5.17$
941.299	22.2	H	Quasi-Peak	$< \pm 5.17$

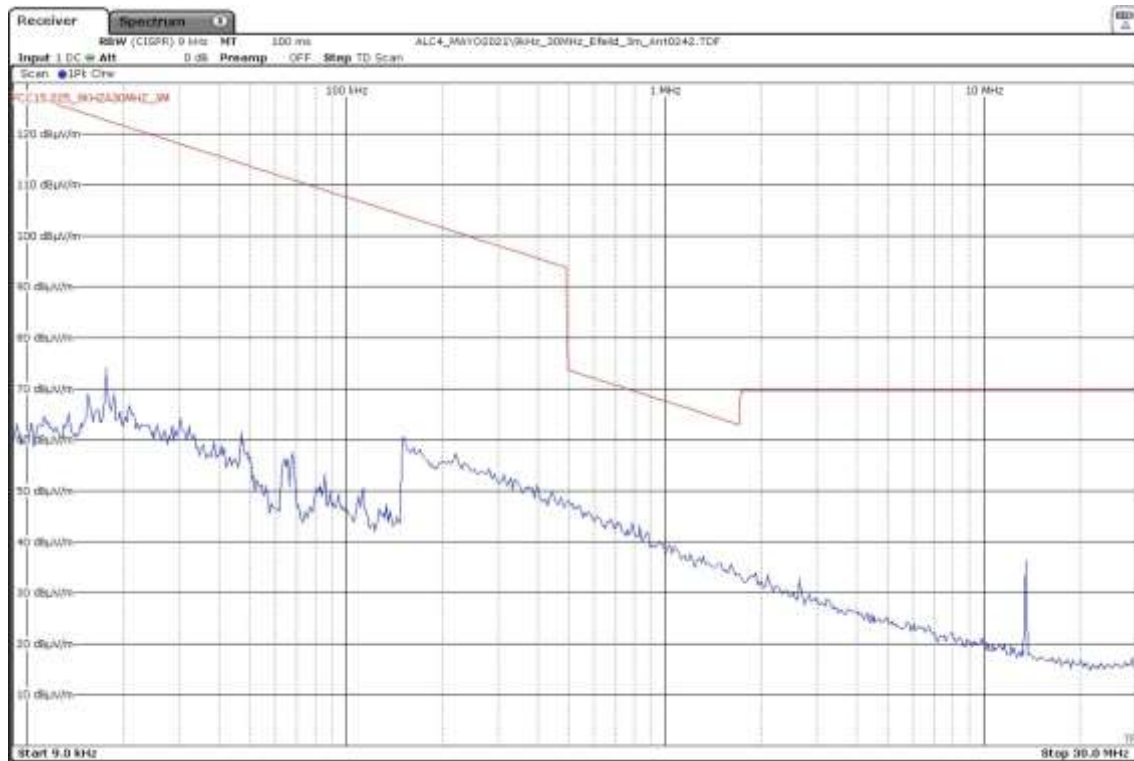
Frequency range 1 - 26 GHz

Spurious frequencies detected closest to the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
2.5138	61.57	H	Peak	$< \pm 4.11$
	49.24		Average	
2.5299	60.34	H	Peak	$< \pm 4.11$
	49.99		Average	
2.5445	60.41	V	Peak	$< \pm 4.11$
	47.33		Average	
2.5549	60.57	V	Peak	$< \pm 4.11$
	47.93		Average	
4.8044	49.97	H	Peak	$< \pm 5.13$
7.2068	57.33	H	Peak	$< \pm 5.13$
	52.02		Average	$< \pm 5.13$
17.7538	44.74	H	Peak	$< \pm 4.81$
19.5487	44.69	V	Peak	$< \pm 4.81$
25.1119	45.72	H	Peak	$< \pm 4.81$

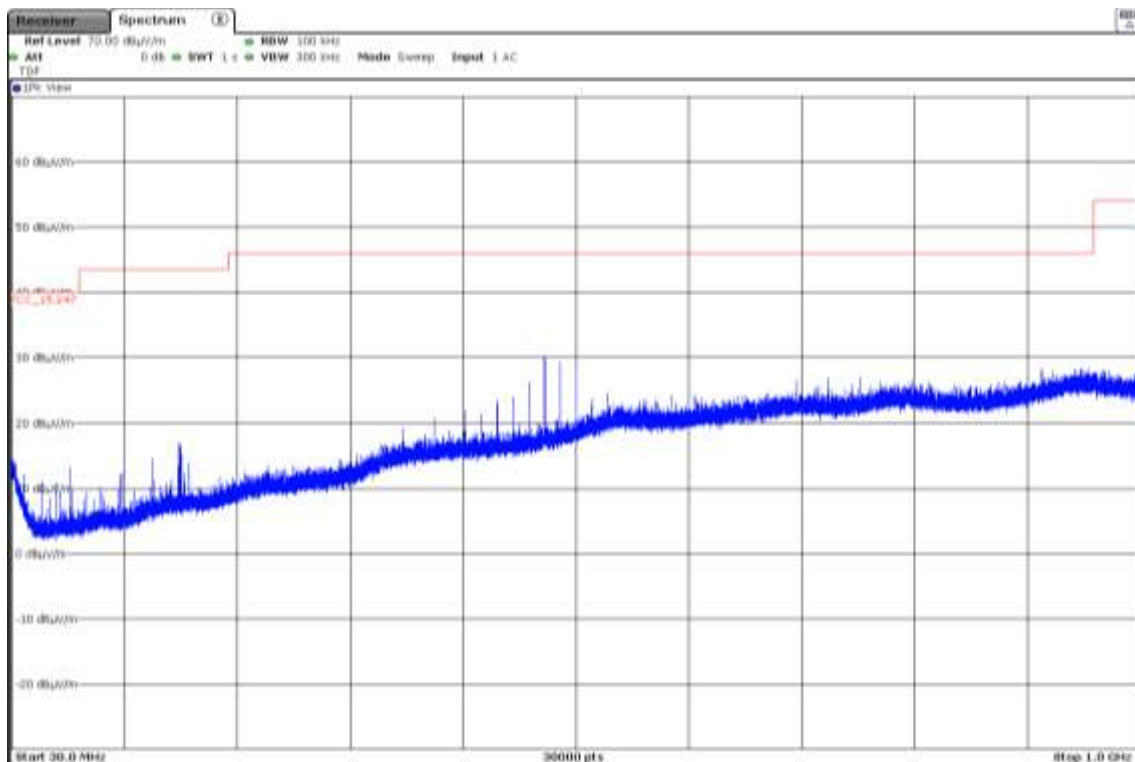
Verdict: PASS

FREQUENCY RANGE 9 kHz - 30 MHz



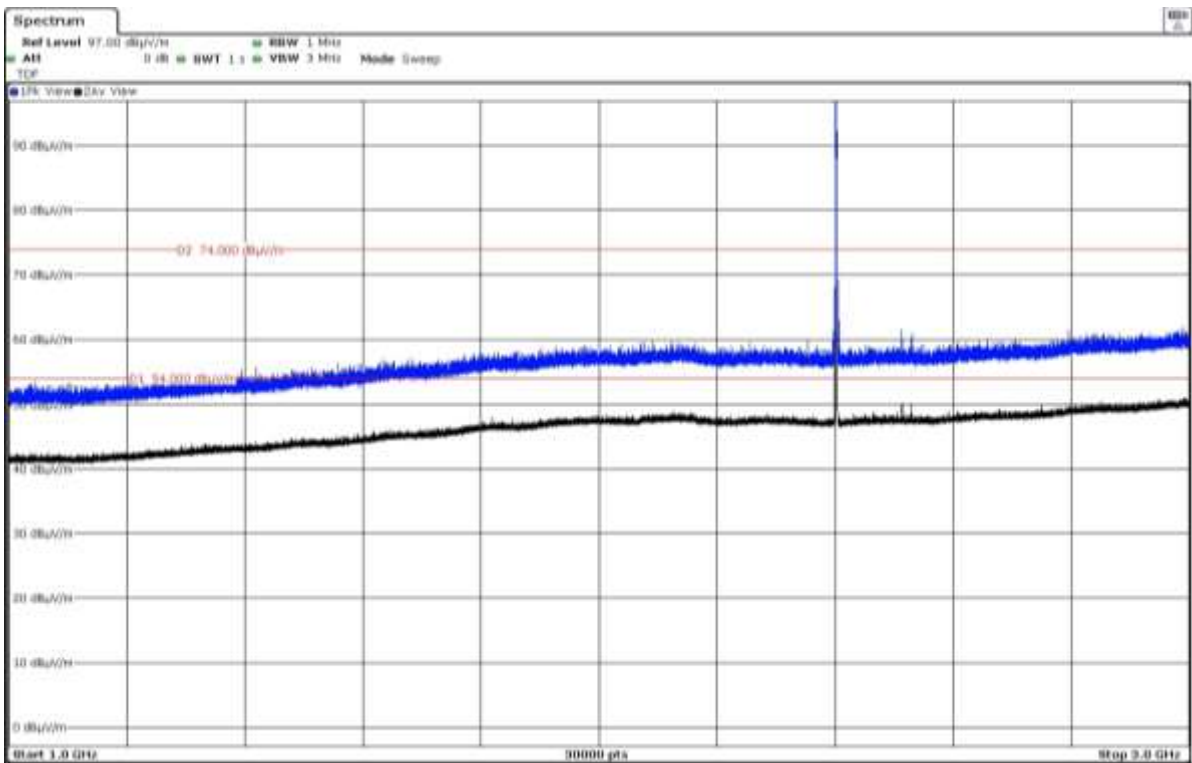
The highest peak is the carrier frequency (RFID 13.56 MHz)

FREQUENCY RANGE 30 MHz - 1 GHz



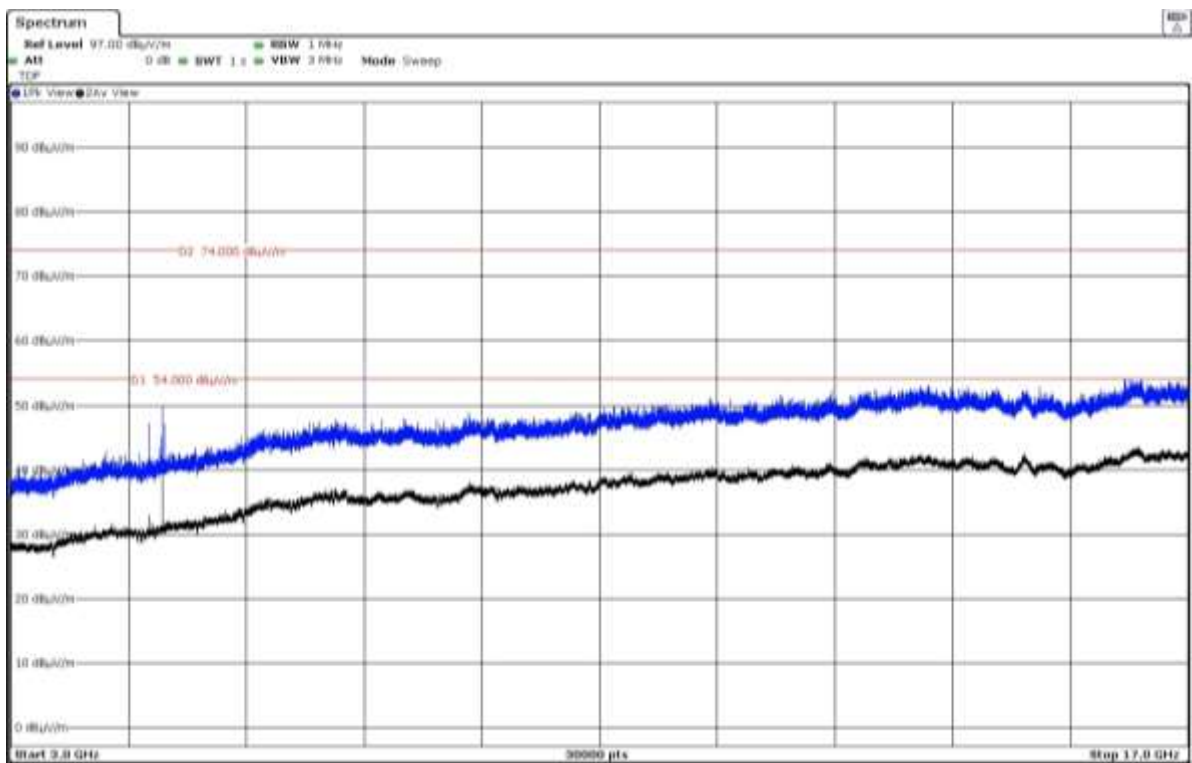
The plot shows the worst case result during scan with peak detector.

FREQUENCY RANGE 1 – 3 GHz



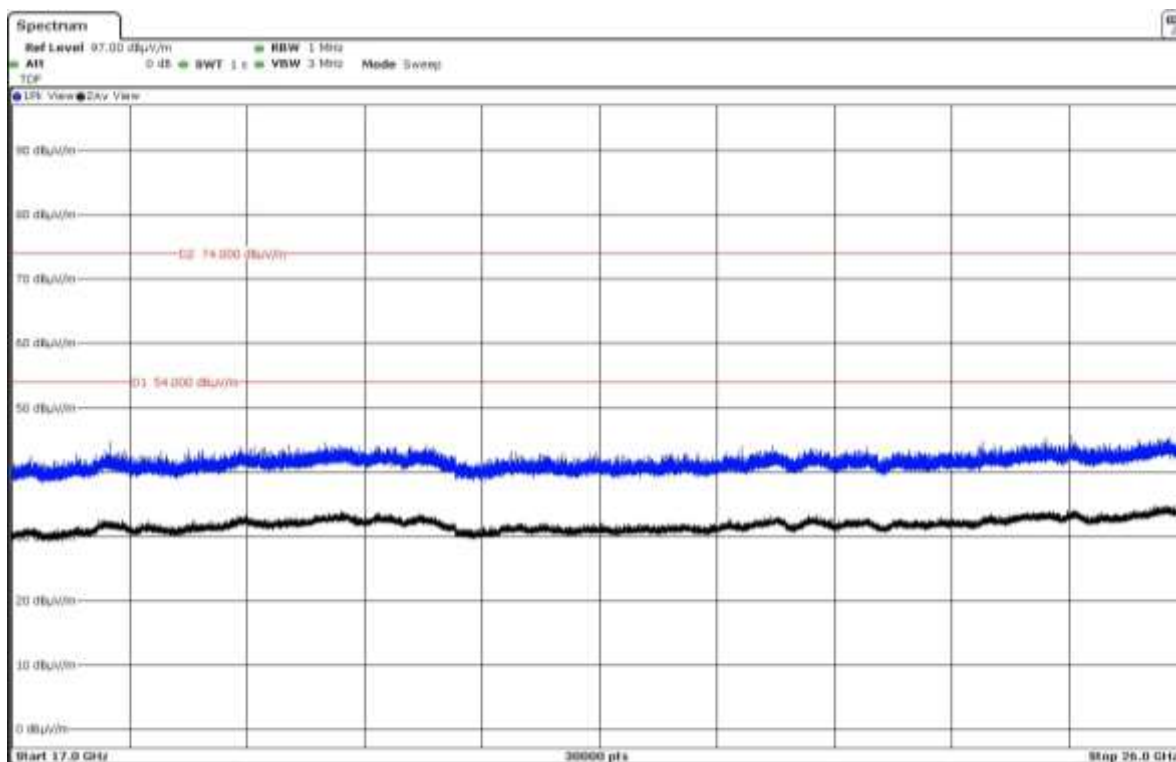
The highest peak is the carrier frequency (Bluetooth Low Energy)

FREQUENCY RANGE 3 - 17 GHz



The plot shows the worst case result during scan with peak detector.

FREQUENCY RANGE 17 - 26 GHz



The plot shows the worst case result during scan with peak detector.

2. Co-location Bluetooth Low Energy 2M and RFID 13.56 MHz

Frequency range 9 kHz - 30 MHz

The spurious emissions do not depend on either the operating channel or the modulation mode.

No spurious frequencies detected at less than 20 dB below the limit.

Measurement uncertainty (dB): $< \pm 3.04$

Frequency range 30 MHz - 1 GHz

The spurious emissions below 1 GHz do not depend on either the operating channel or the modulation mode.

Spurious frequencies detected at less than 20 dB below the limit.

Spurious frequency (MHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
474.567	25.0	V	Quasi-Peak	$< \pm 5.17$
488.115	28.5	V	Quasi-Peak	$< \pm 5.17$
501.727	27.3	V	Quasi-Peak	$< \pm 5.17$
515.275	26.7	V	Quasi-Peak	$< \pm 5.17$
705.072	26.5	H	Quasi-Peak	$< \pm 5.17$
732.232	28.0	H	Quasi-Peak	$< \pm 5.17$
759.295	26.6	H	Quasi-Peak	$< \pm 5.17$
786.487	24.9	H	Quasi-Peak	$< \pm 5.17$
944.597	22.4	H	Quasi-Peak	$< \pm 5.17$

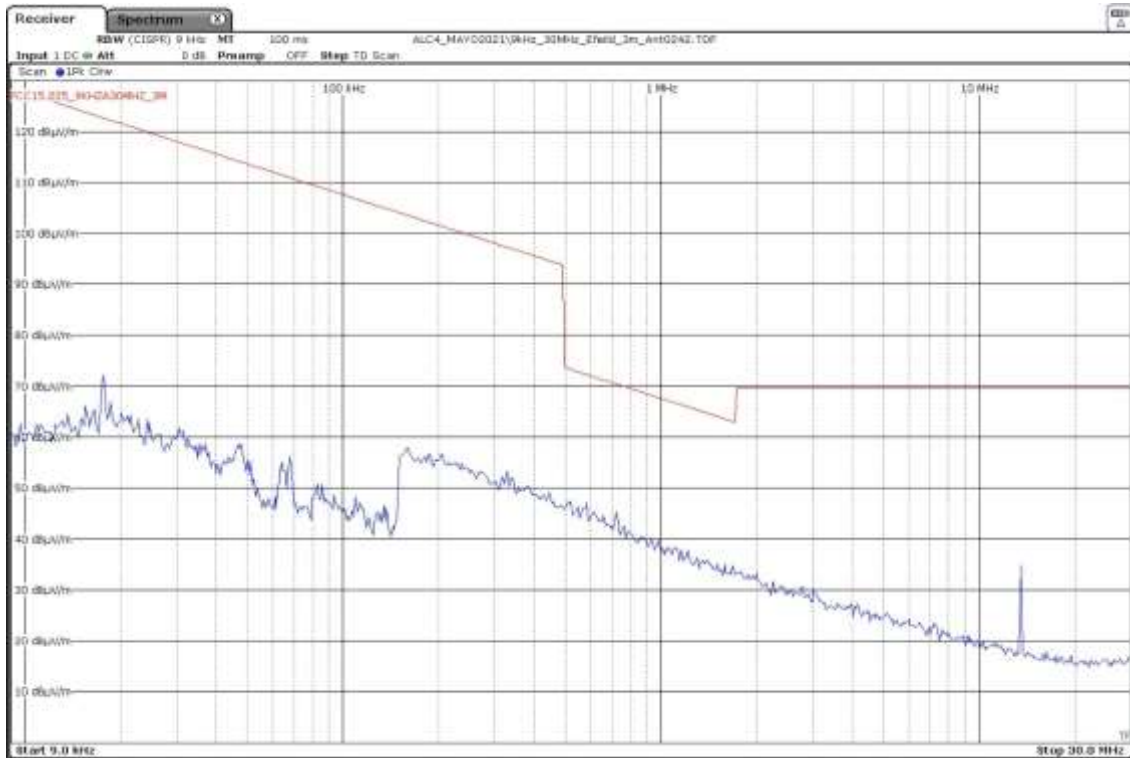
Frequency range 1 - 26 GHz

Spurious frequencies detected closest to the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
2.9403	61.75	V	Peak	$< \pm 4.11$
	49.45		Average	
2.9593	62.51	H	Peak	$< \pm 4.11$
	49.52		Average	
4.8039	49.65	H	Peak	$< \pm 5.13$
7.2072	55.86	H	Peak	$< \pm 5.13$
	48.89		Average	
10.1779	50.25	V	Peak	$< \pm 5.13$
14.4681	53.29	V	Peak	$< \pm 5.13$

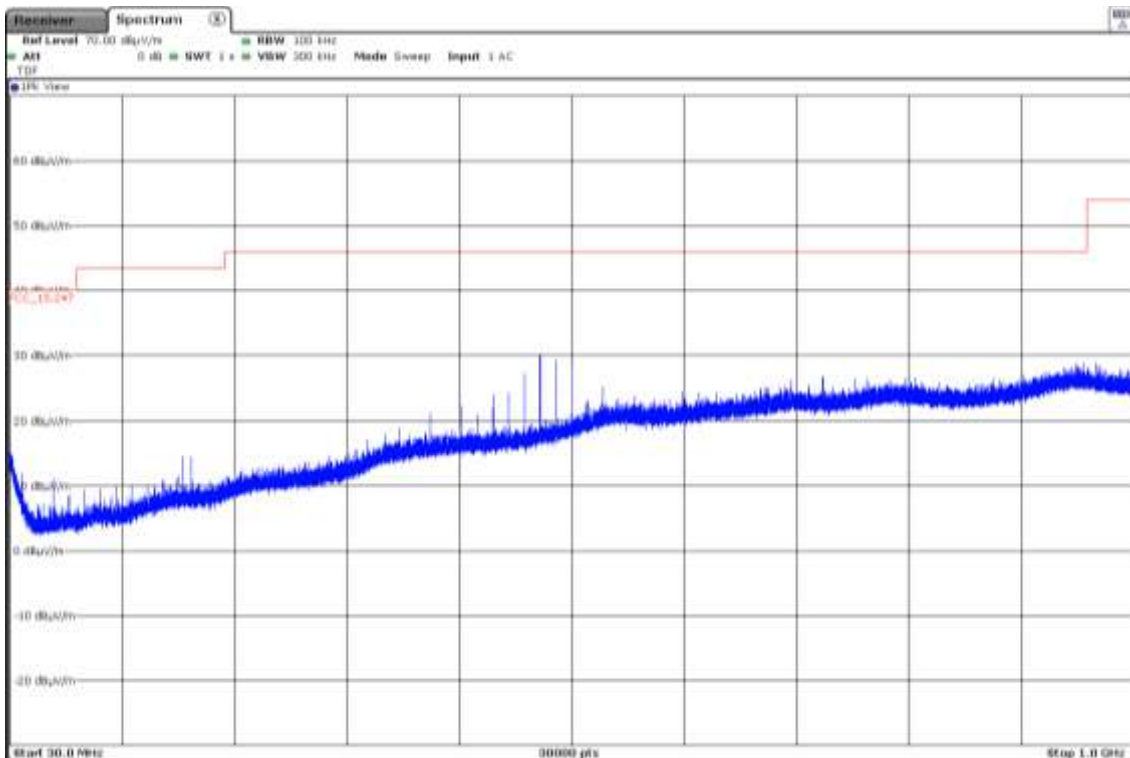
Verdict: PASS

FREQUENCY RANGE 9 kHz - 30 MHz



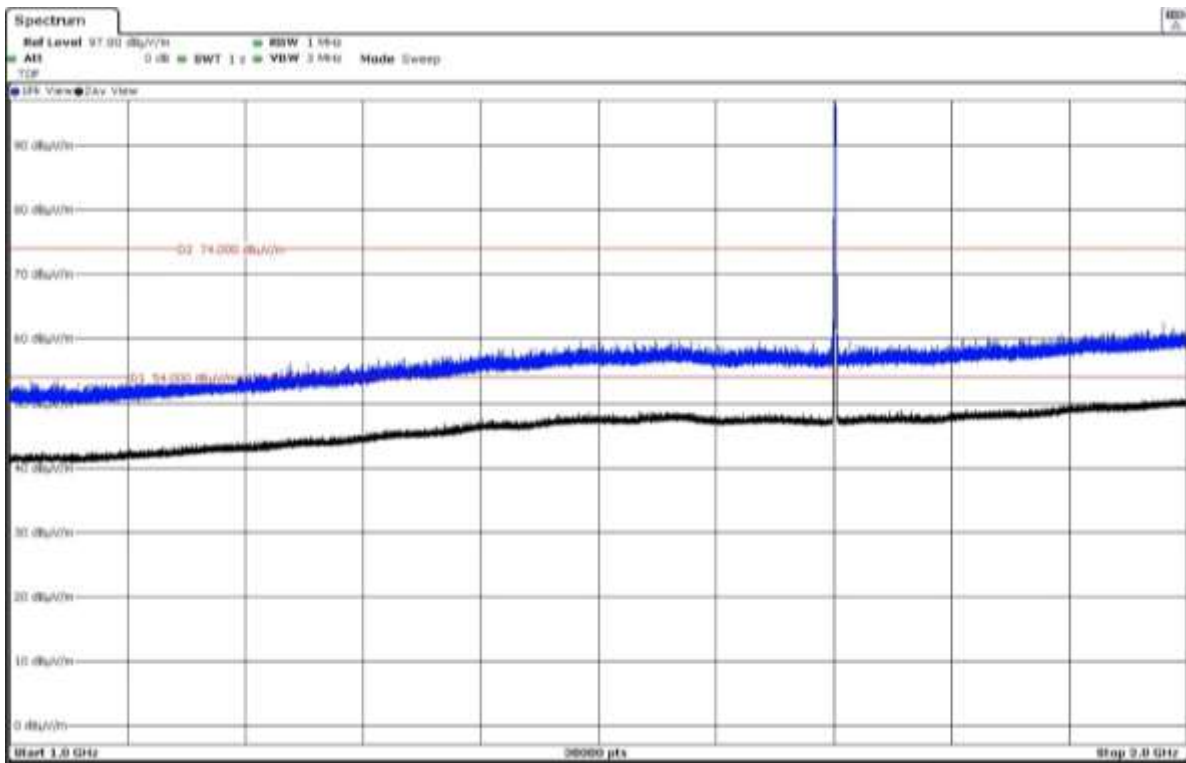
The highest peak is the carrier frequency (RFID 13.56MHz)

FREQUENCY RANGE 30 MHz - 1 GHz



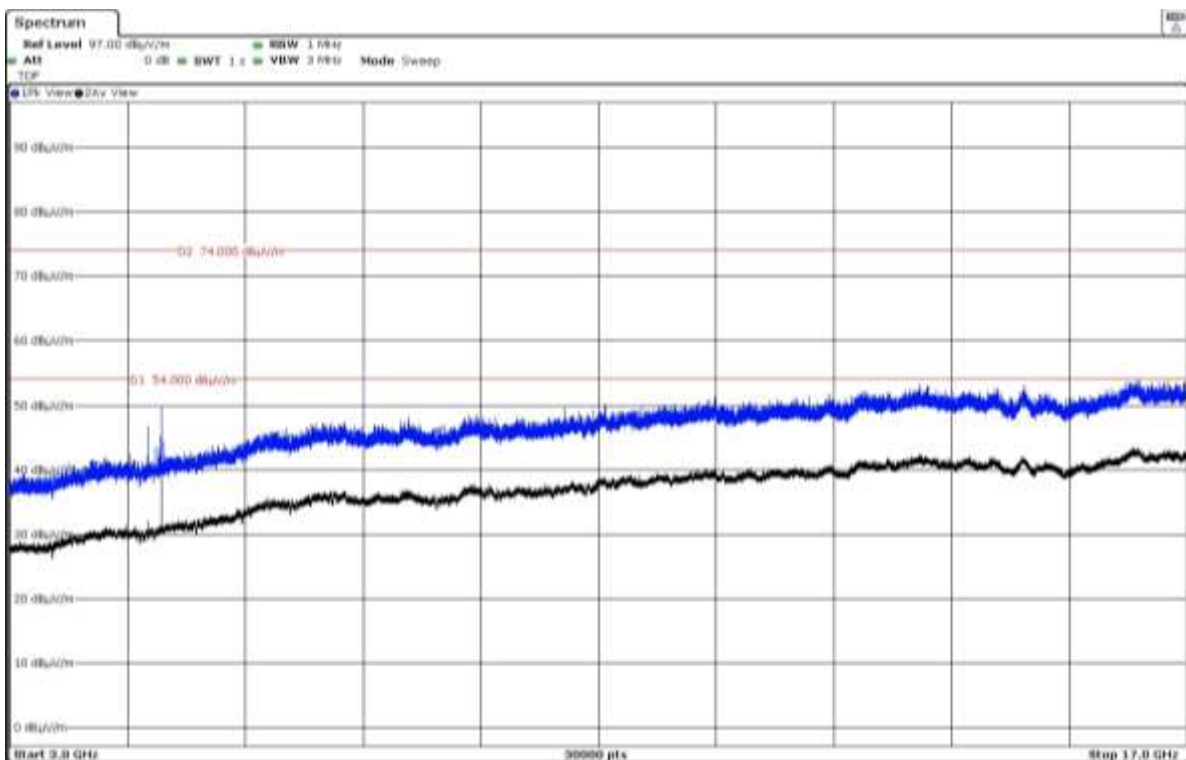
The plot shows the worst case result during scan with peak detector.

FREQUENCY RANGE 1 – 3 GHz



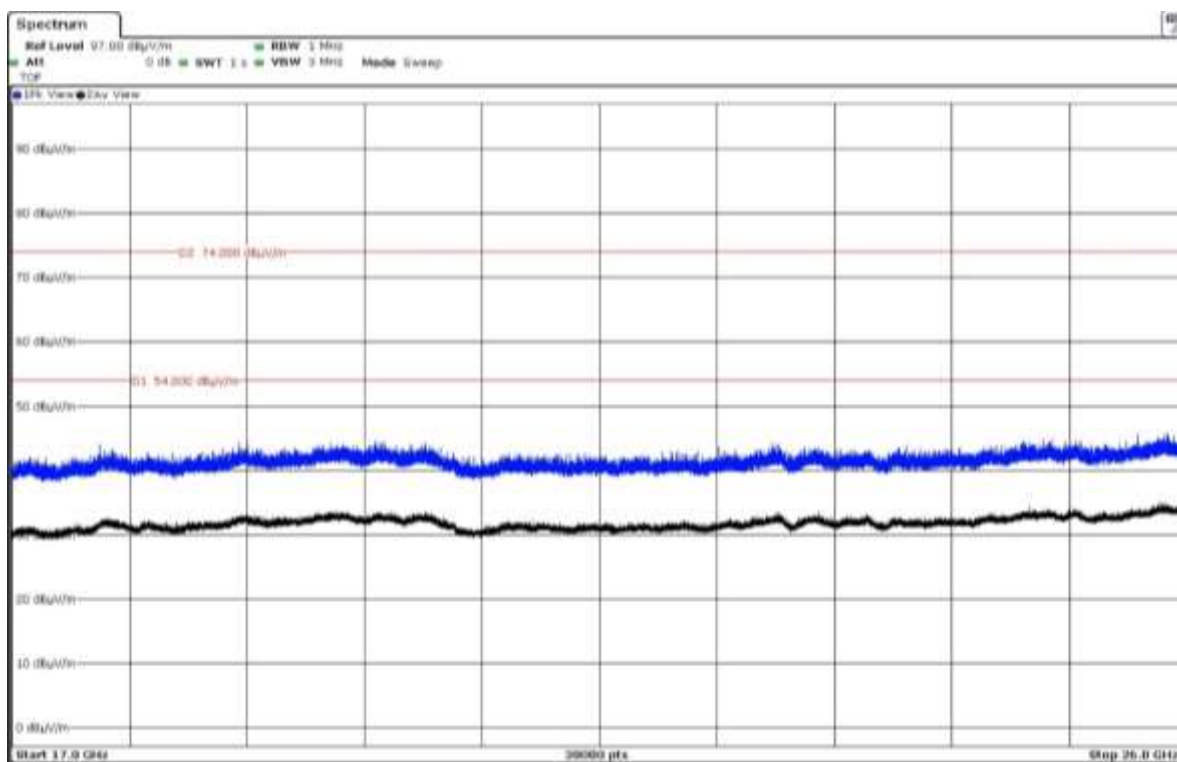
The highest peak is the carrier frequency (Bluetooth Low Energy)

FREQUENCY RANGE 3 - 17 GHz



The plot shows the worst case result during scan with peak detector.

FREQUENCY RANGE 17 - 26 GHz



The plot shows the worst case result during scan with peak detector.